

REMARKS

Claims 3-4, 6-7, 9, and 18-25 are pending. Claims 5 and 10-13 are cancelled, and new claims 18-25 are added with this response. No new matter is added. Reconsideration of the application in light of the above amendments and the following remarks is respectfully requested. *Note:* The element “forming a second metal layer over said ferroelectric layer;” had been left out of the previously amended claim 1 as a typographical error (but had not been cancelled or deleted). Claim 1 has included this element throughout prosecution, and its inclusion now is not an amendment, but rather a full recitation of claim elements.

I. REJECTION OF CLAIM 10 UNDER 35 U.S.C. § 102(e)

Claim 10 was rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Publication No. 2003/0176073 (Ying et al.). Claim 10 has been cancelled and, accordingly, withdrawal of the rejection is respectfully requested.

II. REJECTION OF CLAIMS 3-7, 9, AND 11-13 UNDER 35 U.S.C. § 103

Claims 3 and 6 were rejected as being obvious over Ying et al. in view of Moise et al. Withdrawal of the rejection is respectfully requested for at least the following reasons.

i. There must be some suggestion or motivation to combine Ying et al. and Moise et al.

As discussed in MPEP § 2143.01, in order for a combination of references to be appropriate, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine reference teachings. As set forth in more detail below, the applicants believe that an adequate showing has not been made. Accordingly, if the §103 rejection is maintained in a subsequent office action, the Applicants request a showing of such a suggestion or motivation.

- ii. ***Ying et al. and Moise et al. each teach a three step plasma etch process for etching a ferroelectric capacitor. As set forth below, however, the three-step process in each reference is carried out at a temperature that categorically excludes a combination with the other reference. Thus, the proposed modification of Ying et al. in view of Moise et al. would render the prior art unsatisfactory for its intended purpose, and therefore one of ordinary skill in the art would not be motivated to combine the references.***

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). See also MPEP § 2145. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (emphasis added).

In order to manufacture a ferroelectric capacitor, Ying discusses a three step plasma process in paragraphs [0028]-[0031]. Specifically, Ying discloses etching top electrode layers 250, 255 in paragraph [0029]; etching PZT layer 240 in paragraph [0030]; and etching bottom electrode layers 230, 235 in paragraph [0031]. Ying discloses that during the plasma etch process, **“substrate 210 [is heated] to a temperature above between about 250° and 450° C., and preferably to a temperature of about 350° C.”** [0028] (emphasis added).

Moise generally discusses its three step plasma process on col 9, line 55 – col 10, line 38. Specifically, Moise teaches that **“[these] steps are all carried out at relatively low temperatures (e.g., less than 200° C.)”** Col. 10, lines 33-34 (emphasis added).

Therefore, a person of ordinary skill in the art would be unsuccessful if he or she tried to combine the processes of Ying and Moise because the temperatures at which the processes are carried out differ significantly. In other words, Ying and Moise expressly teach away from their combination. Not only are the temperature ranges

different (with no overlap between the two ranges), but Ying expressly provides that a “hot chuck heats the substrate” while Moise is carried out “with backside wafer cooling.” (Ying [0028], and Moise [col 10, lines 34-35], respectively).

Therefore, the proposed modification set forth in the pending Office Action would render the prior art unsatisfactory for its intended purpose and the combination of references is improper. Accordingly, withdrawal of the obviousness rejection is respectfully requested.

- iii. Ying et al. and Moise et al. do not teach a PZT etch with BCl₃ and Cl₂ in a range of ratios from 1:4 to 10:1, particularly when such etch is carried out at temperatures between 200°C and 500°C, as recited in claim 7. Because Moise et al. teaches away from such an etch, claim 7 is nonobvious in view of the prior art.**

“A *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention.” MPEP § 2144.05 (citing *In re Geisler*, 116 F.3d 1465, 1471 (Fed. Cir. 1997)).

Claim 7 of the present invention recites that “**all etch process are performed at temperatures between 200°C and 500°C.**” As discussed above, Moise expressly teaches away from carrying out such an etch process. Moise, col. 10, lines 33-34 (stating “[**these**] **steps are all carried out at relatively low temperatures (e.g., less than 200° C.)**”

Thus, even if Ying and Moise are combinable (which they are not based on the previous arguments), Moise expressly teaches away from the claimed invention of claim 7. Therefore, claim 7 is nonobvious in view of Ying and Moise and Applicants request a notice of allowance of the same.

- iv. Ying et al. and Moise et al. do not teach a PZT etch with BCl₃ and Cl₂ in a range of ratios from 1:4 to 10:1, respectively, as recited in claims 3 and 6, and it would not be obvious to obtain such ratios by routine experimentation because the recited ratio range is not a result-effective variable.**

As admitted in the Office Action, neither Ying et al. nor Moise et al. teach the gas ratios of BCl₃ and Cl₂ from 1:4 to 10:1 as claimed. The applicants incorporate the arguments in Reply to the Office Action Dated October 6, 2005 herein, and re-assert that the Office Action is incorrect in finding that it is obvious to obtain the claimed ratio range by routine experimentation.

The Applicants emphasize that a results-effective variable has been defined as "a variable which achieves a recognized result." MPEP § 2144.05. In the present instance, ***Ying et al. do not provide any mention of BCl₃ and Cl₂ for etching the ferroelectric dielectric layer.*** Thus, Ying et al. do not achieve a recognized result as it relates to claims 3 and 6. Further, ***Moise et al. provides no hint that a ratio range may impact the sidewall profile of the capacitor stack.*** Therefore, Moise et al. do not achieve a recognized result as it relates to claims 3 and 6.

Therefore, claims 3 and 6, and the depending claims associated therewith, respectively, are non-obvious over the cited art. Accordingly, withdrawal of the §103 rejection is respectfully requested.


III. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 20-0668, TI-34580.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Assistant Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: May 10, 2006


Christine Gillroy